

# RELEASE 1+ PERFORMANCE MODELING

- Why Performance Modeling
- System Description
- Model Description
- Initial Results
- Future Plans

# WHY PERFORMANCE MODELING

- Risk Mitigation Approach
- Early Identification of System Performance Problems
- Provides Basis of Design Choices & Evaluation of Performance Requirements
- Provides Focus for Performance Testing
- Becomes Basis of Capacity Planning During O&M Phase

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# SYSTEM DESCRIPTION

- Information Sources
- Physical Architecture
- Hardware Design
- Software Design
- System Threads
- System Overhead

# INFORMATION SOURCES

- Physical Architecture & Hardware Design - Technical Architecture Team
- Hardware Service Rates - Vendor Web Pages
- Software Design - Release 1 Design Team
- Threads - Top Down Architecture Team

# HARDWARE CHARACTERISTICS

- CPU Execution Rates - SPECint92
- Disk Seek & Rotational Delays & Transfer Rate
- Network Link Transfer Rate

# SOFTWARE CI SERVICE DEMANDS

- Applications, Utilities, Middleware
- COTS, GOTS, Custom Code
- Service Demand per CI Execution
  - Processing - CPU Utilization, Service Time or Instructions Executed
  - Storage I/O - Amount of Data Read/Written
  - Network I/O - Amount of Data Transferred

# SYSTEM THREADS

- Execution Flows
- Frequencies



# EXECUTION FLOWS

- Derived from TDA Threads
- Defined in terms of Software CIs
- CIs are mapped to Physical Architecture

# FREQUENCIES

- Input Data Rate & Duration/Message Sizes
- Arrival Rate/Interarrival Time
- Number of Data Streams, Workstations, etc.

# SYSTEM OVERHEAD

- Network Protocols - TCP/IP, ISP, Ethernet, ATM
- Middleware
- System Functions
  - O/S
  - Network Management
  - Security
  - Enterprise Management

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# MODEL DESCRIPTION

- Modeling Methodology
- Model Components
- Model Implementation

# MODELING METHODOLOGY

- Modeling Paradigm - Queueing Network
- Initial Modeling Technique - Analytical Queueing Theory
- Advantages - Quick & Relatively Accurate
- Disadvantages
  - Mean Value, Steady-State Results Only
  - Limited in Representing Some System Complexity

# MODEL COMPONENTS

- Node CPU & Disk Queues/Servers
- Network Link Queues/Servers
- Software CIs mapped to Node Servers
- Workloads/Threads
  - Inter-node Flows -> nodes & links
  - Intra-node Flows -> SW CIs

# MODEL IMPLEMENTATION

- PC-based Queueing Network Package - Performance Analysis ToolBox (PATB)
- Distributed System Templates - No Programming
- 1-2 Seconds Execution Time for CCS Model on Pentium PC



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# INITIAL RESULTS

- Mean Value, Steady-State Performance Metrics
- Workload Delay, Component Delay, Resource Utilization
- Release 1 Performance Assessment
  - Baseline Results
  - Sensitivity Analyses

# RELEASE 1 PERFORMANCE ASSESSMENT

- No Performance Problems for Release 1
  - All CPUs & Disks Utilized Less Than 20%
  - Network Links Utilized Less Than 3%
- Potential Bottlenecks
  - Firewalls
  - FEP CPUs
  - Application Server Disk

# RELEASE 1 PERFORMANCE ASSESSMENT (Concluded)

- Sensitive Performance Parameters
  - Analysis Product Size
  - Disk Characteristics
    - Access Time
    - Write Buffer Size
    - Number of Striped Drives
  - Software CI Service Demand

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# FUTURE PLANS

- Analytical Model
  - Add Release 2 Functions & Threads
  - Add Network Management, Enterprise Management & Security Overhead
  - Modify Physical Architectural Representation to Reflect BB Data Server Changes
  - Perform Additional Sensitivity Analyses & Refine Parameters

# FUTURE PLANS (Concluded)

- Discrete Event Simulation Model
  - Final Version of Physical Architecture with Full CCS Functionality & Loads
  - Being Implemented in OPNET Simulation Tool
  - Status: Paper Design Completed; Partially Implemented
- RMA Model (Reliability/Maintainability/Availability)
  - Not Enough People Bandwidth to Pursue Now